injunction, and there can be little doubt that the continuance of the 'American' examination system depends upon so conducting examinations into the novelty of alleged inventions as to make the seal of the patent office a powerful, if not conclusive, presumption that the patent is valid."

The commissioner further reports that "during the past year the patent office has earned a surplus, over every expense, of $241,074.92, and the total balance to the credit of the patent fund now in the treasury of the United States is $3,872,745.24, and that the inventors of the country cannot understand why the government takes their money and then fails to provide necessary facilities."

Such a state of affairs is simply a disgrace to the country and to the committees of Congress entrusted with the care of this great instrument of national advancement. The work of the association should be forwarded by every citizen and promoted by every journal in the land. The indifference of the members of the committees of Congress having charge of the business interests of the country can only be accounted for by the fact that the people, and especially the business men of the country, who should continually consult with and direct these committees, pay no attention to this branch of legislative work. Were these committees carefully made up of men well-posted in the work entrusted to them, and were they kept up to their duty by the pressure of public opinion, the prosperity of the nation would be vastly better assured than now.

SOME RECENT MINERAL DISCOVERIES IN THE STATE OF WASHINGTON.

WHEN I visited Washington Territory in the autumn of 1887, I found great activity among the prospectors in the mountainous region lying near the Canada line, and between the Cascade Range and the Bitter Root division of the Rocky Mountains; also in the Cœur d'Alene region. Many fissure veins carrying gold, silver, lead, zinc, copper, etc , had been discovered, and tested sufficiently to prove their richness. In some cases the precious metals were associated with iron carbonates, but more commonly with iron sulphides, galena, and lead carbonates. Chlorine, antimony, and zinc were also found in combination. Copper was found both native and combined. The gangue was usually quartz, with which is often associated what is called "porphyry." The country rocks are granite, quartzite, argilite, and limestone.

On my return to the country in 1891 (now the State of Washington) I found that there had been no loss of reputation in respect to any of the mining localities; but that in all except the Cœur d'Alene and Colville regions the development of ores had been retarded by the lack of transportation.

In 1887, the Cascade Range proper, though rich in the purest magnetite along its crest, and in the Cretaceous lignites along its flanks, was not regarded as a promising field for the discovery of the precious and base metals. A few small veins of low grade silver, gold, and copper ore had been found among the iron bearing rocks about the head springs of the Snoqualmic River, but nothing to compare with the developments on the waters of the Methow, Okinagane, Kootenai, Cœur d'Alene and upper Columbia, on the east of the Cascade Range. But during my visit to the State last autumn I found an army of prospectors and miners at work on a group of veins running along the western flank of the Cascade Range. This group or belt so far as discovered is about fifty miles long and fifteen miles wide (perhaps twenty miles wide), and occupies the eastern edge of Snohomish and Skagit Counties. The region is drained by the upper waters of the Skagit, Stillaguamish, and Skykomish Rivers. The veins are well-defined fissures carrying gold, silver, lead, copper, and sulphur with iron, antimony and arsenic in quartz and porphyry; in other words, the same sort of veins as those found in eastern Washington. Usually they follow the course of the country rocks, but with the usual branching and flexing.

The country rocks, which consist also of granite, quartzite, and slate (I saw no limestone) usually stand nearly vertical, though in some places inclining eastward with a dip as low as thirty degrees. The general trend of both country rocks and ore veins is a little more to the north-east than that of the irregular crest-line of the main mountain. Hence they all cross the mountain at a sharp angle immediately north of the Cascade Pass, the name given to the notch at the head of the Cascade River, which is one of the chief affluents of the Skagit River. This locality has within two years become famous as the "Cascade Mining District." Here have been opened numerous veins of auriferous pyrites and argentiferous galena. The veins are broken across by a deep gorge, whose steep sides are striped by the disclosed vertical edges of the veins. Of course, in many places the outcrops are concealed by soil and vegetation, but the mountains rise three to four thousand feet above the gorge (six to seven thousand feet above Puget Sound), and the upper third is bare rock, and numerous denuded spaces extend much lower. The physical conditions are favorable for prospecting, mining, concentrating, and moving. The mountain on the north side holds near its summit two small glaciers: the lower one I named the Silver Queen, the upper one the Skylight. Snow slides and running gravel are uncomfortably common on these heights. But safe camping ground can always be found in the evergreen forests on the mountain sides. So much for the north end of this mineral belt.

The other leading mining district is at the south end of the belt, and is known as the Silver Creek District on one side of a dividing ridge, and the Monte Cristo District on the other side. Silver Creek is a tributary of the Skykomish River, and has its head in Silver Lake, a beautiful little sheet of water nestling among the evergreens in a groove of one of the lofty outliers of the main range. The creek, after running in its elevated trough for two or three miles suddenly begins to pitch down a steep escarpment, and falls a vertical distance of two thousand feet in three miles of surface measurement, and falls fifteen hundred feet more in the next five miles, at the end of which it joins the north branch of the Skykomish River. Its course is southerly.

The Monte Cristo District is made by a continuation eastward of the veins of the upper half of the Silver Creek District, which pass through the water-shed into the valley of the Sauk River, a tributary of the Skagit. Taking this part of the mineral belt across its widest part it measures at least twelve miles, probably more. The ores do not differ materially from those of the Cascade River country, and the veins stand on each side of the gulches, offering every facility to the miner. Not less than thirty distinct veins (or ledges) have been uncovered, and many tunnels of several hundred feet in length have been driven horizontally The best "rich streaks" are of argentiferous galena, which in a few cases are as much as four feet wide (generally much less), and carry from thirty to three hundred ounces of silver to the ton.

This new mineral region is as yet but very partially ex-

amined. It is, however, a permanent addition to the vast mining territory of the Rocky and trans-Rocky Mountain country, and when considered in connection with previous discoveries, it suggests the probability that the mineral deposits of the State of Washington exceed in quantity and value those of any other State.

W. H. RUFFNER.

Lexington, Va., Jan. 23.

THE EVOLUTION OF THE LOUP RIVERS IN NEBRASKA.

THE most casual inspection of a map of central Nebraska might suggest that the hydrography of the region has probably undergone radical changes. It looks as if the three Loup rivers, and the smaller creeks running parallel to them, had once been separate tributaries of the Platte, all independent of each other, as roughly indicated by the dotted lines on the map (Fig. 1). The Platte is the great central trunk of the drainage, and these streams all seem to be headed for it like branches, and would join it directly if they had not been somehow turned eastward and united to form the Loup River.

It is the fate of such impressions to fade out in the light of accurate knowledge, but there are some survivals, and this

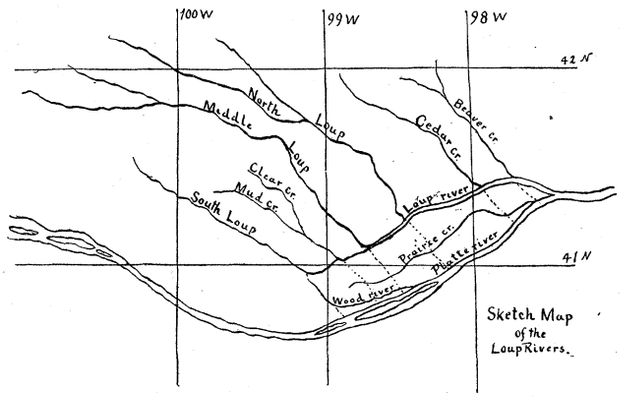

FIG. 1.

bids fair to be one of them. I have, I think, verified it by field work, and I will briefly recount some of the topographic and geological data which tend to confirm the first impression.

The Loup rivers flow in channels excavated from fifty to two hundred feet in soft tertiary marls. Taking them in succession from south-west to north-east each stream is lower than the preceding one. A profile on a line at right angles to the general south-east course of all the streams of the Loup system, would have the general character roughly represented in Fig. 2.

This general north-east slant of the country gives a great advantage in rapidity of erosion to all ravines on the south-west side of each stream. They become longer, deeper, carry more water, and are cut down more rapidly than those on the north-east side of the next higher stream, because they run with the slope of the country and have a lower outlet. Thus the space between the streams is captured by the more vigorous headwater erosion of the north-easterly tributary. Presently a branch more vigorous than the rest captures the headwaters of its neighbor lying to the south-west. This imparts still greater vigor of attack, and the succeeding captures in the same direction are hastened.

The latest robbery in the Loup system is that of the headwaters of Wood River. Journeying down from the headwaters of the South Loup one is impressed with the apparent continuity of its valley with that of Wood River, rather than with that of the South Loup itself below Callaway. It is obviously an instance of the lower, more easterly stream cutting through the divide and drawing to itself the headwaters of the higher one.

This series of captures by lower tributaries is exhibited on a grand scale and in a mature form in the Loup system. Another example on a smaller scale, and in its incipient stages, is shown in Fig. 3. The streams *a* and *b* have each captured the headwaters of some streams lying westward, and *a* threatens to capture the headwaters of *b*.

In this case, on the Republican River, the slant of the country is directly east, and is due to the Rocky Mountain upheaval, which gave an eastward tilt to the great plains.

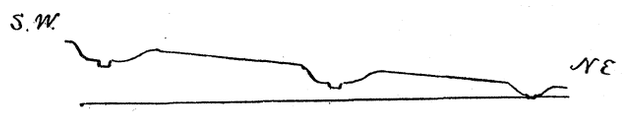

FIG. 2.

In the Loup region there is also, in addition to the eastward slope, a pitch to the north-east, which has a more local origin, but is, none the less, an important factor in the evolution of the Loup system. The last great tertiary lake (Cheyenne) submerged the Loup and the Republican completely, but left the upper Platte a vigorous mountain stream, bringing down silt at a rapid rate. This silt, quickly subsiding in the still lake waters, formed a succession of bars off the mouth of the river, as the shore line shifted east and west in the vicissitudes of climate, and of upheaval and subsidence. There was no permanent point of discharge, and consequently no permanent single bar, but a general distribution of silt in and along the channel of the Platte, which accumulated to such an extent as to raise the level of this river above that of the Loup on the north and the Republican

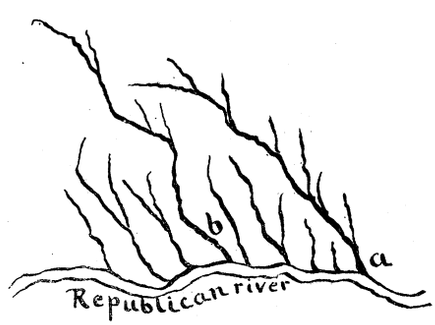

FIG. 3.

on the south. This is true in the case of the Loup, notwithstanding it is a tributary of the Platte, and the anomally is explained by the lower gradient of the Loup. The tributary is at the same level as the parent stream at the point of confluence, but the Platte falls 7.1 feet per mile and the Loup only 5.6 feet per mile. This brings the Platte rapidly above the Loup in following them upwards from the point of confluence. It is true that this lower gradient of the Loup is itself anomalous, so that I have only explained one anomaly by another. The full explanation of the second would require another article.

The natural result of excessive deposition along the Platte would be to crowd the mouths of its tributaries eastward and obliterate their old channels. Not only would they be turned to the east by the mass of silt in their former path, but